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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,385	03/29/2001	Shunji Wada	WATA:010	5498

7590

09/11/2003

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EXAMINER

ROY, SIKHA

ART UNIT PAPER NUMBER

2879

DATE MAILED: 09/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/820,385

Applicant(s)

WADA ET AL.

Examiner

Sikha Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

The Amendment, filed on July 1, 2003 has been entered and is acknowledged by the Examiner.

Specification

The disclosure is objected to because of the following informalities:

Page 11 line 3, '10 mn' should be replaced by --10 nm-- .

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,009,922 to Harano et al. in view of U.S. Patent 6,262, 441 to Bohler et al.

Regarding claim 1 Harano discloses (Fig. 7 column 5 lines 42-50, column 8 lines 9-21) transparent conductive film of tin-containing indium oxide is formed by ion plating method. Harano discloses that the vapor deposition material 3 of sintered indium oxide containing tin is evaporated and the evaporated particles deposit on the substrate 6 thus forming an ITO film on the glass substrate. The specific resistance (resistivity) of the ITO film (Table 1 example 2) is $1.3 \times 10^{-4} \Omega\text{-cm}$. The sintered product of indium oxide contains 0-10 wt. % of tin. Furthermore Harano discloses that by increasing the

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gas pressure during the formation of the film by ion plating method the compressive stress in the ITO film is reduced. The less compressive stress results in less surface roughness in the film.

Harano does not disclose the surface roughness of 1-10 nm of the film. The transparent conductive film being produced by the same method of ion plating as disclosed in the specification using Argon and Oxygen, at discharge current of 200A, and substrate at a temperature 200°C and pressure of 3×10^{-4} Torr or higher, it would have been obvious to one having ordinary skill in the art at the time of invention to specify the ITO film inherently possesses the surface roughness having a value between 1-10 nm.

Claim 1 differs from Harano in that Harano does not exemplify the work function of the transparent conductive film.

Bohler in relevant art of organic electroluminescent device disclose (column 3 lines 50-60) ITO film having work function of 4.9 ev. Bohler further discloses that by suitable choice of anode (conductive ITO film) material of high work function efficient injection of charge carriers into the light emitting layer and hence low operating voltage can be achieved.

Therefore it would have been obvious to one of ordinary skill in that art at the time of invention to modify the work function of the transparent ITO film of Harano to be 4.9 ev as disclosed by Bohler for achieving efficient injection of charge carriers into the light emitting layer and hence low operating voltage in an electroluminescent device.

Claim 6 essentially recites the same limitations as of claim 1 and hence is rejected for the same reason.

Regarding claims 3 and 5 Harano and Bohler disclose the transparent conductive film with work function 4.9 ev, specific resistance of $1.3 \times 10^{-4} \Omega\cdot\text{cm}$ and low surface roughness of 1-10 nm formed on the transparent substrate. Furthermore Bohler discloses (column 5 lines 45-52) an electroluminescent device with anode formed of transparent conductive ITO film having high work function, organic positive-hole transport layer (TNATA), aluminum III salt of 8-hydroxyquinoline as emitting layer and an electron transport layer laminated in sequence on the substrate.

Regarding claim 4 Harano and Bohler disclose the energy barrier between the conductive film anode and the hole transport layer to be small for operating the the device at lower driving voltage but do not disclose the limitation of energy barrier being equal or smaller than 0.7 ev. It has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. Thus, it would have been obvious to one of ordinary skills in the art at the time the invention was made to specify the energy barrier between the conductive film and the hole transport layer to be 0.7 ev or less, since discovering an optimum value of a result variable is considered within the skills of the art.

Response to Arguments

Applicant's arguments with respect to claims 1 and 6 have been fully considered but they are not persuasive.

In response to the applicants' argument that Harano will not produce a film as claimed, the Examiner respectfully submits that transparent conductive film with specific resistance of $1.3 \times 10^{-4} \Omega\text{-cm}$ as disclosed by Harano is produced by the method of ion plating using Argon and Oxygen, at discharge current of 200A, and substrate at a temperature 200°C and pressure of 3×10^{-4} Torr or higher. The condition under which the film is produced being same as that disclosed in the specification it would have been obvious to one having ordinary skill in the art to specify the ITO film inherently possesses the surface roughness having a value between 1-10 nm. Furthermore the examiner notes that it is evident from applicants' disclosure (Table 1 page 18) that the change of the wt. % content of tin oxide does not produce significant change in the value of the surface roughness in the film produced by ion plating. Hence the transparent conductive film of Harano with tin content of 0-10 wt.% will have surface roughness between 1-10nm.

Harano discloses the tin content in the sintered product is 0-10 wt.% which indeed includes the range of 4-6 wt % as claimed. Harano discloses that this (0-10 wt. %) content of tin is most preferable to obtain transparent conductive film having lowest resistivity.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,316,343 to Wada et al. discloses evaporation material containing 4 wt. % of tin oxide. U. S. Patent 6,259,202 to Sturm et al. and JP

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09003628 to Ooyamaguchi et al. and JP 2000128698 to Murayama disclose production of ITO film with low specific resistance and surface roughness.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

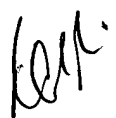
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

S.R.

Sikha Roy
Patent Examiner
Art Unit 2879


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